Autonomous Electromagnetic Control System for Binding boots to a Snowboard, Skis or similar

Object of the invention

The present invention relates to an autonomous electromagnetic control system for binding boots to a snowboard, skis or, generally any board used in sports such as skateboarding and surfboard. The inventive system is disposed on the clothing and boots of the sportsperson as well as on the board, in order to ensure the safe practice of said sports. The system is based upon a magnetic link between the boots and the snowboard or skis, a link that can be detached by the sportsperson at will by his/her own action on some electrical switches, either manually through an electric cable transmission or, with electromagnetic waves from voice commands by means of a voice recognition device and an emission-reception system, or by means of infrared rays transmission and a emission-receptor system.

Background of the invention

Currently the fixation or fastening system, in short, are the following:

Types of Bindings for skis

a) Telemark binding: in this type of fixation only the front end of the boot is fixed on leaving the heel end totally free. This makes it easier for the skier to move on the downhill.

b) Cross-country binding(Nordic skiing): similar to the tele-mark binding. This fixation allows only the heel of the boot to be free so that one can make great strides and ease the forward movement on flat terrain with the help of two long poles.

c) Alpine Ski binding: this fixation is composed of two devices, the heel and the front end. When the forces that are imposed on the binding reach the predetermined limits in relation to the weight and aptitude level of the skier, the boots are detached from the bindings by way of some springs. The front end is released principally because of lateral or vertical forces that are placed on it, while the heel end is detached mainly because of vertical forces.

d) Ski Mountain bindings: Combination of devices of the two former technologies. To go up, the skier is helped by some seal skin on the heels of the skis and by the free heel impact, on the other hand, going downhill, it positions the heel device and, without the skin, it slides as in the Alpine Ski type even though with more rudimentary fixations.

e) Snowblade bindings: These are used in this ski discipline in which the skis are small, between 50-100 cm in length, and on which the boot is set with a clip system. This type of setting was first developed for the hard-boot snowboard bindings, as a fixed or set system which only allowed manual release. In case of serious accidents it can come off, which is more of an inconvenience than an advantage because of the skiers loss of grip with the snow or ice.

All the developed technology in the ski market up to the present is basically focused on getting the boot/bindings system to be more sensitive to possible vibrations, and bending due to the increase in speed, jumps, hits or other incidents because of lack of technique or skill. Moreover, there is an additional problem since the existence of two skis and its length(2 meters or more) often provokes the entangling of both with the resulting accidents, specially with beginners.

In these last few years, the patents in this sector have focused on contributing solutions which will allow to be ahead of the appearance of the mentioned forces or inconveniences, which are those which cause injuries, in such a way that the bindings are released from the boots at the minimal indication of skis getting cross-braced, of jumps or of extreme vibrations. The detection of these signs through sensors allow for the automatic opening of the bindings. This system is not in the market yet.

The recent evolution of skiing to the so-called era of Carving should also be taken into account; in this type of skiing, the length of the skis have been reduced considerably; up to 40 cm. and at the same time, the width has been increased, which grants the skier more stability, up to the extreme of not having to use poles to make turns.

The number of expert skiers, on the rise these last few years, do not wish their bindings to be released without their wanting since that would not allow them to enjoy their total freedom specially on steep slopes which could provoke the loss of their skis which in turn also the gripping system. All this means that the conventional binding systems must tend to diminish. In this way we should remember that according to the theory of skiing it is recommended that one should not detach from their skis in dangerous situations on steep slopes.

Types of Snowboard bindings

a) Hard boot binding: Binding system for Snowboard runs, composed of hard plastic boots of the Alpine Skier type. A peg is used to set the boot to the snowboard therefore it can only be released manually.

The binding is composed of a metal semi-arch which is set on the boots heel, making use of a gap or crack wherein this semi-arch is inserted. A press-on shutting system on the front end sets the toe cap to the board.

An evolution of this system is based on a new way of setting boots onto the board. Before starting its use, the toe end of the boot is driven in on the front of the binding while the back end of the boot is set by pressing, or vice-versa, leaning down at the same time on the toe end of the boot, not needing to set it manually. In this manner, only the release is manual. This system, called Alpine snowboard, is presently rarely used.

b) Soft-boot binding: this is the most common system and is made up of rubber and cloth boots(of the resting snow boot type) and some bindings composed of two slip jackets made of a mix of nylon and carbon fiber, one for the front end(toe area) and the other in the instep that fastens the heel; the latter has a back gadget that withstands the forces of the back part of the calves. The grip and release are manual using some dented steps and some rattling type pans.

An evolution of this said system called "Step-in", has eased the automatic grip, while the release is still manual. This system is made up of metal binding screwed to the board and of a boot which incorporates several metal components in the sole which allows that when pressure is placed on the boot through the binding against the board, both are set or fastened onto it by pressure. To release the boot from the binding it is necessary to move a peg manually. In some cases the boot has no metallic device but does have cavities on the soles' lateral material allowing for the entry of a trigger in these cavities from the binding found on the board. In no case does this"step-in" system use other technology other than the fastening mechanism one, in the way that it cannot be released but manually. The only new contribution of this technology is the automatic grip process.

With regards to the fastening means of the bindings devices onto the board and the resistance tests, we state the following points:

1. In the past the bindings were anchored by screws which were fastened to the board thanks to a hard aluminum plate inserted in its nucleus.
2. Due to the lack of safety of the former system, female inserts were devised and were situated on the board which allowed screwing on male screws of 6 onto these inserts which turned out to be the standard in the industry. For almost a decade, patents have been focused on distribution and placing of these inserts on the board, a system to monopolize the exclusive use of this type of bindings or kinds of inserts in their boards by some manufacturers.
3. Currently, resistance tests determine the strength that one of these inserts can withstand until it detaches from the board. Since one binding uses 3-4 inserts for it to be set in, it's practically impossible for the user to separate the binding from the board by separation of the inserts or by breakage of the binding.

It should be pointed out that Snowboarding is a sport all in itself with different origins from that of skiing, and that its' safety systems are also different. It is even more desired in Snowboarding than in Skiing that the boots do not detach automatically, from the bindings or from the board. In principle the boots should only detach from the board voluntarily (by manual control or remote). If this is not the case, the practicing is left unprotected if he does not have any point of grasp to the slippery surface and, what is just as or even more important, the other practicing are exposed to a risk of accident caused by an out-of-control snowboard sliding down a piste or slope

Up until today, all these binding systems, being they real models or previous patents, have been based on manually screwing the base of the binding onto the board with a predetermined angle which was always what the boarder or skier would use during the run. To change this angle, he has to stop and take the boot off the board and rotate the bindings with the help of a tool.

Diverse binding systems that use magnetic force and electro-mechanics have been the object of patents.

U.S Patent number 6,007,086 of Hopkins of December 28th 1999, entitled Electric Ski Binding System describes a boot fastening system for skis through permanent magnets

situated in the back part of the toe end, and in the heel of the boots, and others of the opposite poles situated in the "anchor" spots or points of the ski bindings, being equipped with some electromagnets which void the magnetic field created by the permanent magnets to undo the fastening or grip. The system is equipped with an active safety system composed of a microprocessor and sensors situated along the bindings that detect abrupt changes of force and pressure in the system and orders its lock clearing. The main inconvenience here is that this system is not recommendable for a snowboard, as was stated earlier, neither is it for actual Carving type skis which bend sharply. As indicated, this system needs bindings.

U.S patent No.5,820,155 of Brisco, on October 13th 1998, describes a fastening system to a snowboard that incorporates an electro-mechanic quick-release mechanism operated through a combination of transmitter-receptor RF that serves as a secondary release element. Given that the fastening is mechanical and the release is mechanical and electromechanical, the main drawback is that, in case of malfunction, a quick release by remote control in movement will not occur.

The application of Japanese patent No.09-133207 of Hitachi Metals Ltd. Published December 2nd 1998 describes a magnetic device for snowboards wherein it fastens between the boot and the board through permanent magnets. The main drawback is the same as the one stated in the anterior paragraph, since the release system only allows the unlocking of the system by mechanical force done manually, therefore, it is dependent on another mechanism.

U.S patent No. 6,224,086 by Golling from May 1st of 2001 called, Apparatus for Gliding over Snow, describes a system in which only magnetic forces are used to set the ski or snow boots on the snowboard. The principal problem again is the same as the one in the patent cited in the anterior paragraph; the release system only allows the unlocking of the system by manual mechanical force(a lever).

The inconveniences stated are avoided through a fastening system as the one claimed in the annexed claims that show the following advantages over the representative patents of the former technique:

- Eliminates mechanical fastening and releasing, which in turn adds to comfort and quickness.

- Allows instantaneous anchor or grip and release by remote and autonomous control (whenever desired by user), avoiding any dangerous automation when practicing this sport.
- In Snowboarding, the angle and separation of the boots on the board can be changed at rest or during movement through foot action and through an electric switch.
- In Skiing, it allows the forward or backward fixation of the boots to vary the tracing geometry of the turns and using same pair for skis.
- Also, for Snowboarding, it allows for a sliding sensation comparable to its "cousin" board sports (Surfboard and Skateboard).
- Allows sliding on the snow surface with an optimal and safe control, with the possibility to detach from the board or skis in the presence of imminent danger.
- Allows execution of acrobatics, in the "Half-Pipe or Freestyle" disciplines which requires instantaneous and remote release of the board or skis.

DESCRIPTION OF THE INVENTION

The Autonomous Electromagnetic System of Control for Fastening or Binding Snowboard and Ski boots is composed of several rechargeable batteries with electric or solar chargers which can also be of the valve-charger type or similar to it integrated in the boot, several electric switches, some electromagnets or electromagnetic grippers elements placed in each boot, several sheets or slabs, rollers or particles of ferromagnetic material which are housed in the board(s) on which the boots of the user are positioned and fixed for the transmission/reception of opening and closing commands of the switches through electric cables and optionally, through an emission-receptor system of commands using electromagnetic waves or infrared rays to control the switches which can be equipped with a voice-recognition device.

The following is its basic functioning: the batteries are charged by electric current or solar energy (photovoltaic panels). A switch for each boot activates or deactivates the corresponding electromagnets of each boot, connecting to or disconnecting them from the rechargeable batteries. These switches are activated directly by the user either manually or by commands transmitted through an transmitter-receptor system of infra-red rays with the transmitter situated, for exemple, in the gloves, or indirectly through a voice-recognition system that recognizes and interprets the voice commands of the

sportsperson, transmitting the order or command to a transmitter that emits the codified command which is received by a receptor that operates by opening or closing the current flow from the rechargeable battery via to the electromagnets situated in the boots. All these devices are connected between them through the corresponding cables and connectors whenever necessary and are placed in different parts of the clothing and accessories used by the sportsperson, these parts could be, without restrictions, the helmet, the suit, a backpack, a belt, a fanny pack, the gloves, the boots and for some of them, even on the boards themselves.

In the case that electromagnetic grippers is used instead of electromagnets, the setting is produced through permanent magnets whose magnetic force could be offset by the electric activation of the suction which creates a magnetic field opposed to that of the magnet when the switch is turned on, by any of the means indicated, producing the release.

The system is completed with a board or special boards which have sheets or slabs of ferromagnetic material incorporated on the surface on which the magnetic field is deactivated, created by the electromagnets of each boot. that way creating enough attraction strength so that the board or boards do not dettach from said boots.

BRIEF DESCRIPTION OF THE DRAWINGS

To complete the following description and with the objective to help for a better understanding of the characteristics of the invention, several figures are attached through which the innovations and advantages are understood much easier.

Fig.1 schematically shows the sportsperson equipped with a first preferred embodiment of the invention, illustrating some possible location points of the different elements of the system.

Fig.1-A schematically shows one of the boots with the corresponding equipment of the illustrated execution in Fig.1.

Fig.2 schematically shows the sportsperson equipped with a second preferred embodiment of the invention, illustrating possible location points of the different devices of the system.

Fig.2-A schematically shows one of the boots with the corresponding equipment to the illustrated execution in Fig. 2 and 3.

Fig. 3 schematically shows the sportsperson equipped with a third preferred embodiment of the invention, illustrating some possible location points of the different elements of the system.

Fig.4 schematically shows a view of the lower side of the boot where a possible location for the electromagnets or integrated electromagnetic gripperss in the sole of the boot is indicated.

Fig.5, shows a plan view of the board.

Fig.6, shows a plan view of the skis.

PREFERRED EMBODIMENTS OF THE INVENTION

Three possible preferred embodiments of the Autonomous Electromagnetic System of Control of Boot Bindings to Snowboards or Skis are described in the following. An equal and common element for all of them is the snowboard (or skis), which will be dealt with for once at the end of this section, being understood that they are an indispensable part of all the preferred embodiments.

The first preferred embodiment is represented in Figs.1 and 1A. Fig. 1A shows the sportsman with the suit which includes an upper top(8), trouser(7), a belt(1) and boots(5). Located in the belt or fanny back(1) are the rechargeable batteries, with the electric chargers or solars (2) battery, the manual switches(23) and the connectors(3). In the trousers(7) we find the connection elements that fit to the belt connectors(3), the connectors(4) and the conductor cables(15) integrated in the trousers' fabric which join said connection elements to the conectors(4). In each boot(5) there are located: a boot connection element(4b) that fit to the connector(4) of the trousers, a joining cable(20) joined to the boot connection element mentioned and the electromagnets or

electromagnetic grippers(6) connected in parallel to the cable(20). Naturally, connectors(3) and(4) and the connection elements that fit with them are some of the male type and others female types, with as many terminals as needed, normally 2, in the way to allow for the electrical connection between belt(1) - trousers(7) and trousers(7) - boots(5).

Therefore, two independent circuits in the system of control for binding or fastening exist, each of which controls the binding of the corresponding boot separately. Its function is simple since, in the case that electromagnets are used, it is sufficient to manually open or close the corresponding switch(23) so that, if the boots(5) are placed on the surface of the snowboard(22) or skis(26), they get released or fixed with respect to it. In case electromagnetic grippers are used, the function would be the inverse, release occurs with the switch closed, and binding or fastening occurs with the switch openned.

Fig.1A shows a boot(5) in greater detail where one can note the elements of the system integrated in them.

The second preferred embodiment is represented in Fig.2 and 2-A. Fig.2 shows the sportsperson with the suit which includes the top part(8),the trousers(7), and the boots(5'). The top body (8)includes a voice recognition device(14) which alternately can be placed in a support located in the sportsperson neck or in the helmet, and a command transmitter(13). Each boot is equipped with, see Fig.2A, rechargeable batteries(9), integrated in the boots body, a valve-charger set(10), joining connections(21) of the rechargeable battery(9) with the valve-charger(10), a receiver-switch(11), electromagnets or electromagnetic grippers(6), some joining connections(21a) of the rechargeable batteries with the receiver-switch(11), and the connection(21b) of the receiver-switch union(11), with the electromagnets or electromagnetic grippers(6) integrated in the lower part of the boot in its contact with the ground.

Therefore, two independent circuits in the system of control for binding exist, each of which control the fastening of the corresponding boot separately but, different from the first preferred embodiment, its activation or deactivation is through different voice commands, some for the activation and others, for the deactivation, different for the left boot and the right boot, hence, the receiver of each boot is programmed in a different

way by means of a control device formed by the voice recognition equipment(14) and the voice command transmitter(13). Its function is simple since it is enough to voice the necessary password so that the pertinent actions are set forth, first, by the recognition of that password and second, that it has been said by the user so that the transmitter(13) transmits a coded command that when received by the receptors(11)in the boots it is decoded and executed so, if the boots(5') are positioned on top of the surface of the snowboard(22) or skis(26), they are released from or binded to the said boards or skis.

The third preferred embodiment, is similar to the second preferred embodiment except that it is complemented by several switch-transmitters(12) integrated in the sportsperson's gloves(24).

The receptor switches(11) of the boots are activated/deactivated by voice, and also through said switch-transmitters(12), the order generated by said switch-transmitters(12) being the one with priority over the voice commands, which gives this equipment greater reliability and safety. Regarding the function of this third preferred embodiment, it is needed to state that the voice recognition equipment is similar to that of the second preferred embodiment described earlier; moreover, the equipment integrated in the gloves activates and deactivates the switch receptors(11)of the corresponding boot on the same side of the respective button of the switch transmitter(12) of the glove(24).

It is important to note however, that for non-experts in these sports, the options explained in the anterior paragraphs with reference to that each boot could be controlled independently, they can also include the option of programming as well as the transmitters the switches receptors so that the binding or release be simultaneous on both boots by the corresponding command, be it by the switch or by voice command. Also, it should be noted that the control devices could be changed of placement inside the sportspersons' clothing in that these could be integrated in backpacks, glasses, belts or fannypacks, gloves, etc.

Fig.4 schematically shows an interior view of the boot where a possible fixation of the electromagnets integrated in the surface of the boot is indicated(5, 5'). The number of electromagnets and the geometric shapes that are formed by them (straightline,

triangular, quadrangular, etc.) is determined in function with weight and degree of experience of the sportsperson.

Fig.5 shows a flat view and another with perspective of the table(22), where one can appreciate the ferromagnetic material that covers the whole surface of the upper table(16).

Fig.6 shows a flat view and the other in perspective of a ski(25) wherein one can see the ferromagnetic material that covers the whole surface of the upper section of the ski(26).

Once the nature of the presentl embodiment is sufficiently described, and also the three preferred forms are put into practice, we would like to point out , that the former indicated resolutions are susceptible to multiple detail modifications, as long as the essence of the invention is not altered, in accordance to what it is indicated in the former description in a descriptive and non-limiting way.